

## **2013 International Workshop on EUV Lithography**

### **Panel Discussion ( P 7 1 )**

Center for Semiconductor Research & Development

Advanced Lithography Process Technology Dept.

**Tatsuhiko Higashiki**

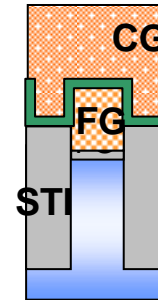
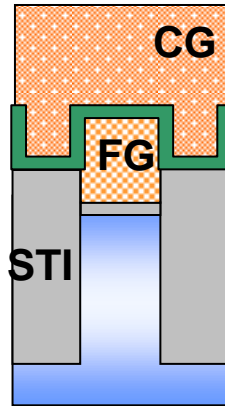
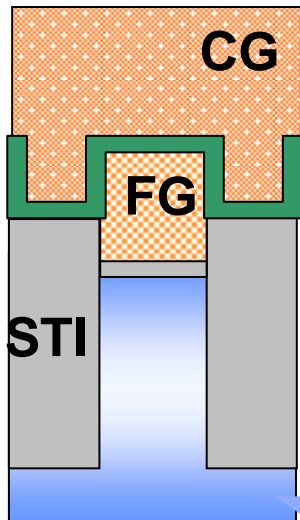
# Road of the Memory

3xnm

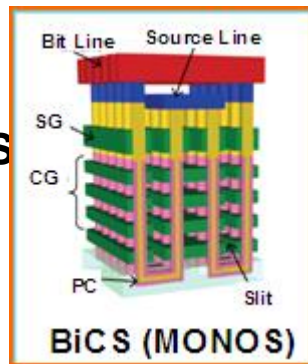
2xm

1x nm

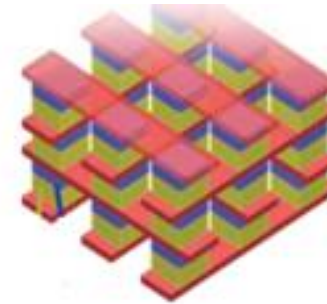
3D化



BiCS

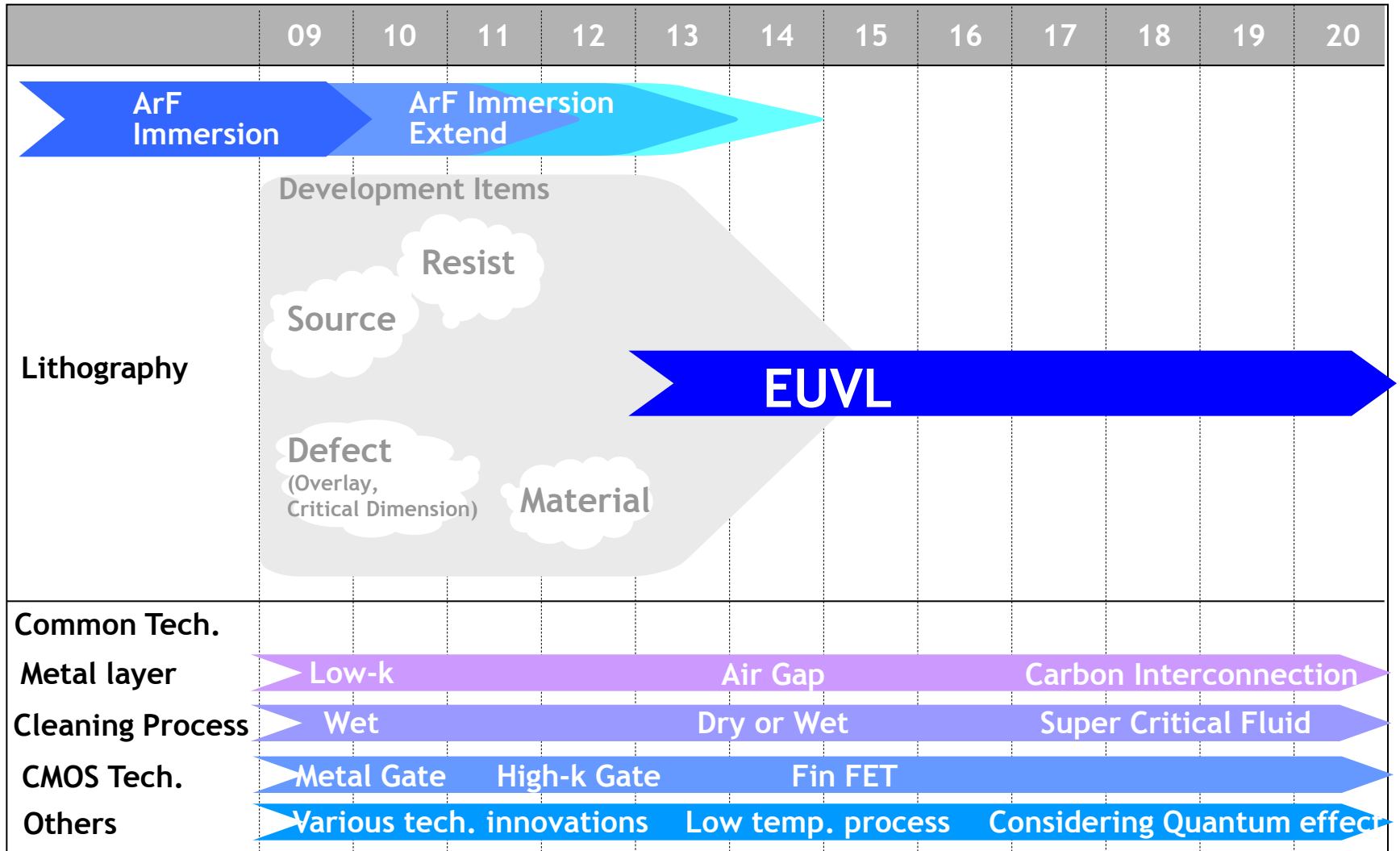


CP(Cross Point), etc

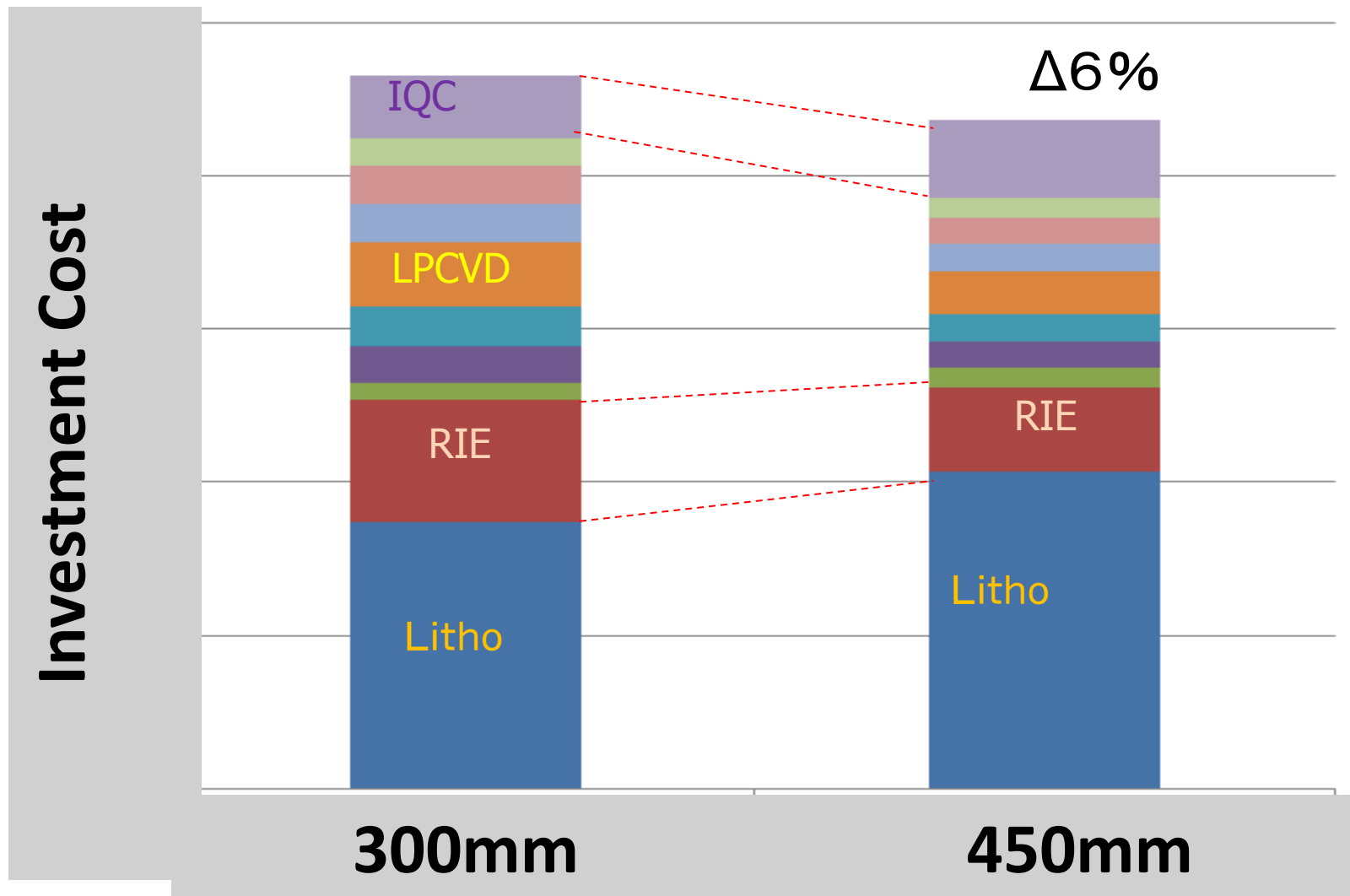


# EUVL Roadmap

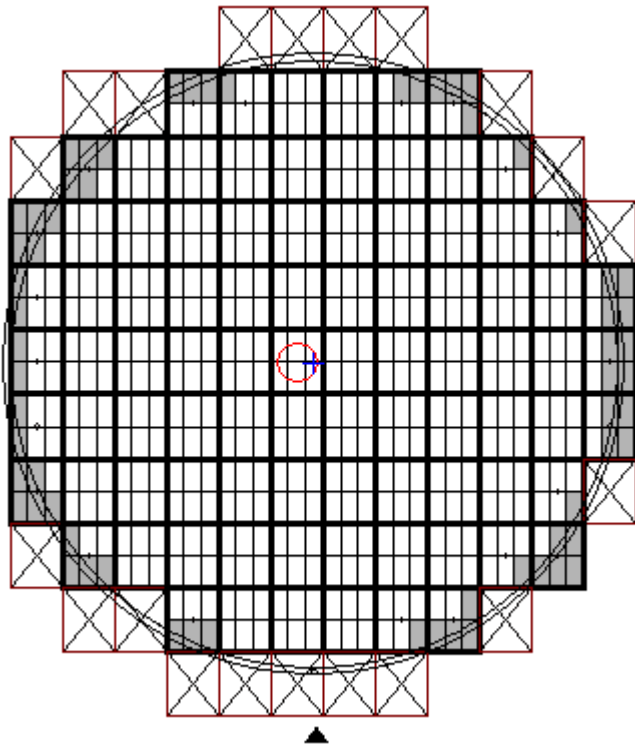
EUV: Extreme Ultra Violet



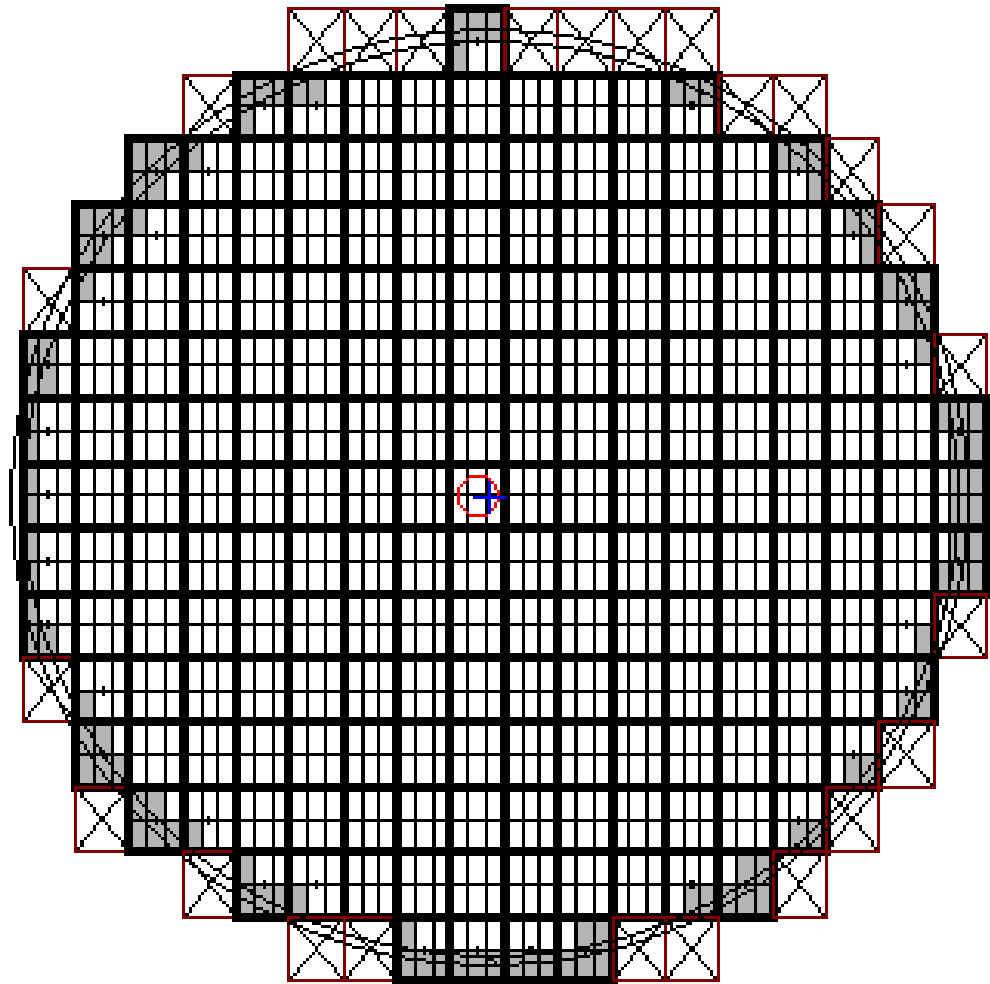
# Cost comparison 300mm vs 450mm



# Gross Up from 300 to 450

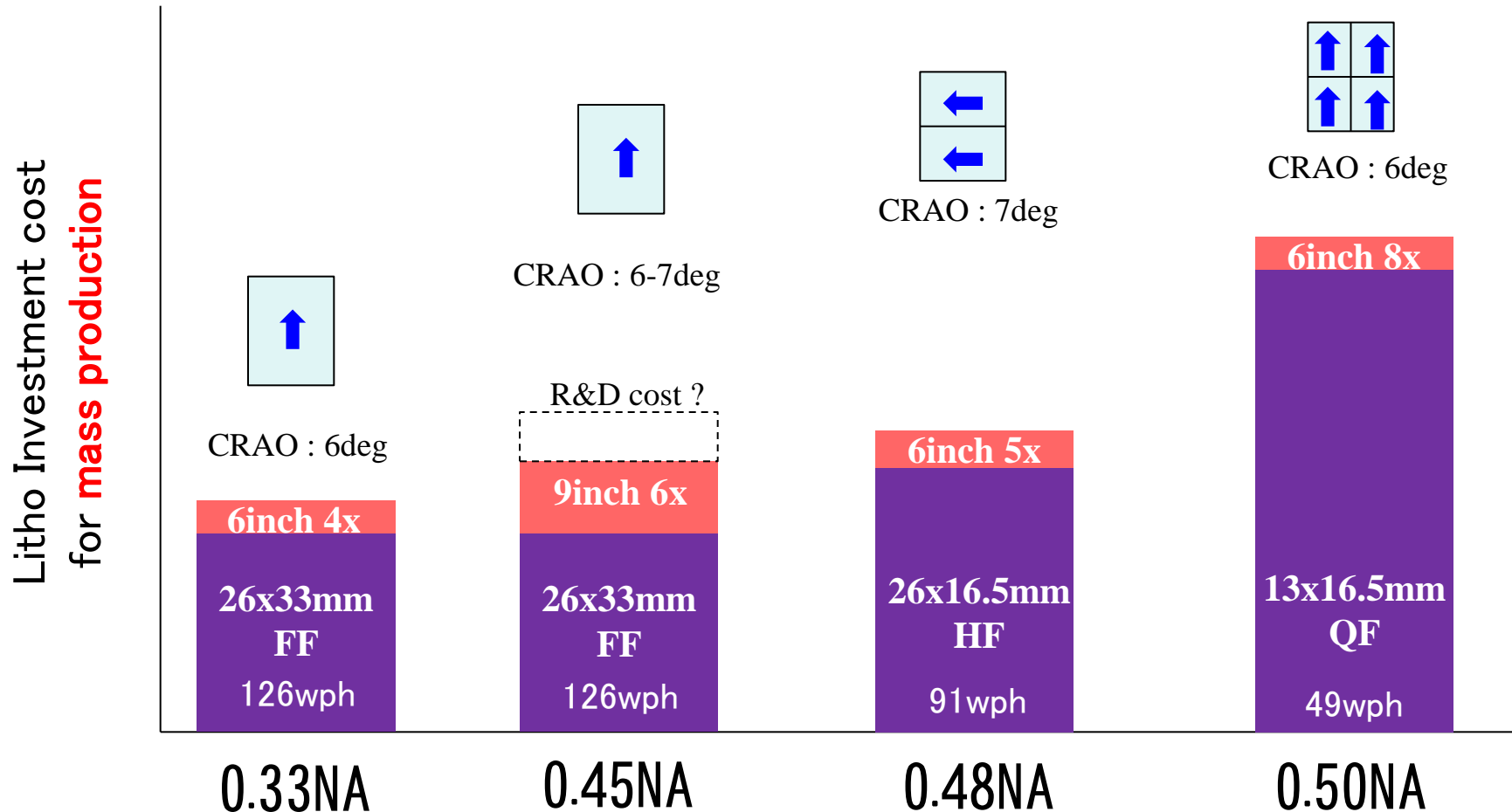


300mm Gross  
Number 470pcs



450mm Gross  
Number 1087pcs

# Relative Cost Comparison for higher NA Tools



Serious CoO increase for those cases are roughly estimated.

open issues:

\*Shot stitching induced CD/OL error amounts have to be evaluated.

\*Chip design restriction should be considered

# Concerns for Higher NA Tool & Reticle specs

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## ➤ OUR BASIC STANDPOINTS

CoO (including total investment costs) is the most important issues for memory device production & business.

➤ Higher NA tool is welcome in the case that it would contribute to reduce the CoO through the shrinkage of chip size, simplification of lithography process.

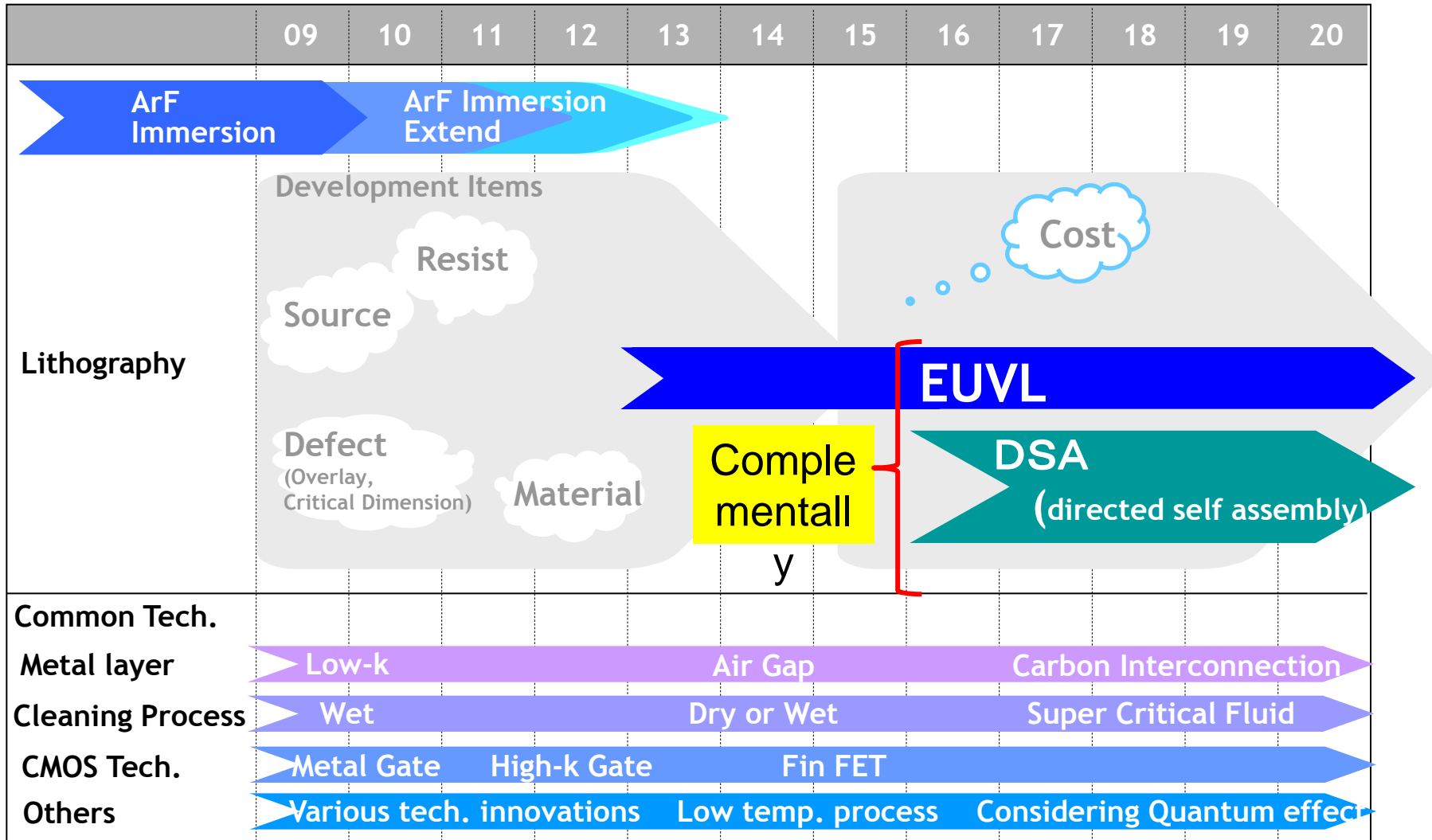
➤ If higher NA tools requires reticle magnification change from 4 to 6 or 8, we have to choose serious increase of reticle production investment or tremendous reduction of productivity .

➤ EUVL+DSA will be one of candidates for sub 10nm lithography.

# Lithography Roadmap

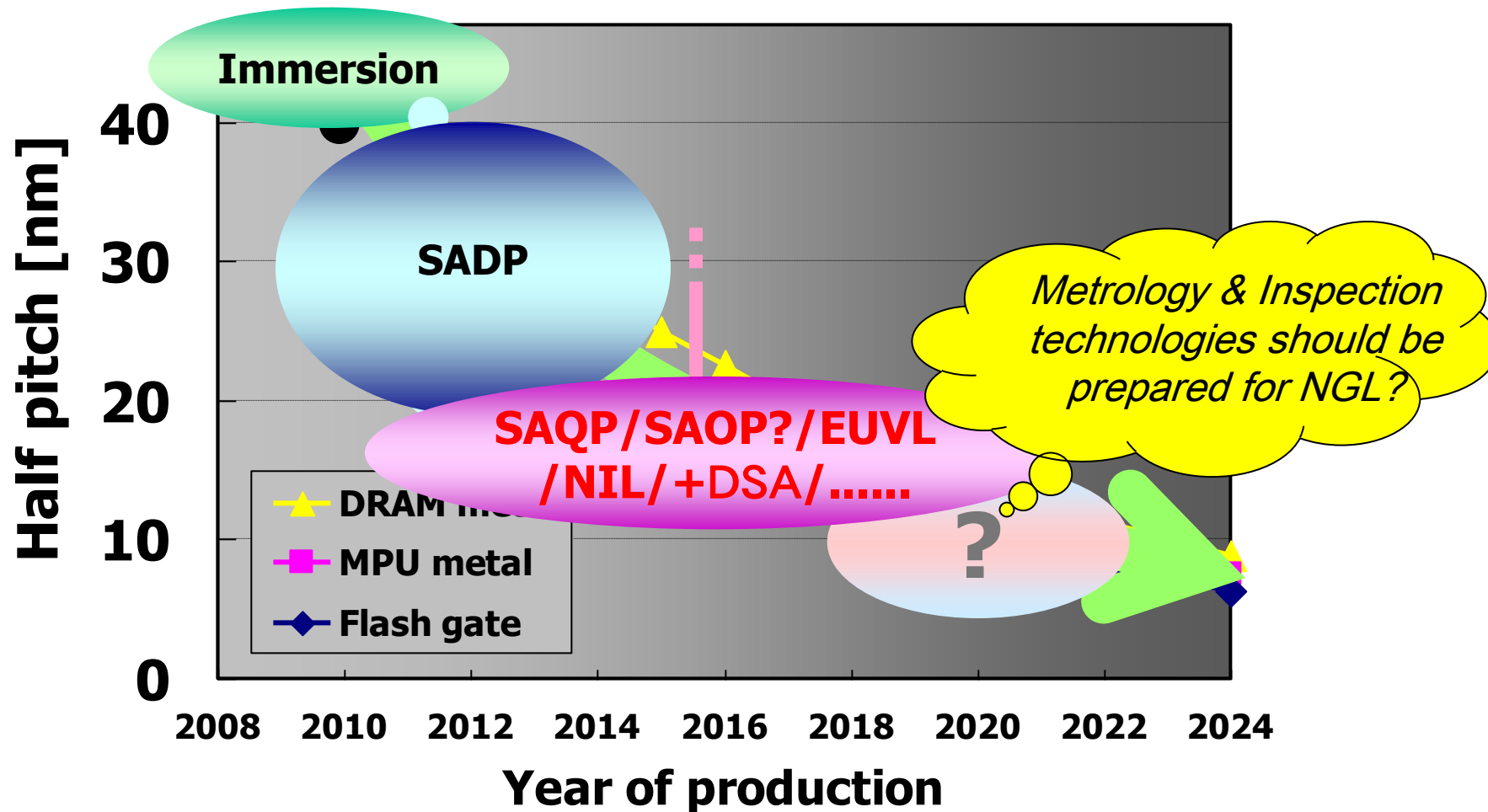
EUV: Extreme Ultra Violet

DSA: Directed Self Assembly





# Key Challenges for Shrinking



# summary of Questions for Panelist

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## ■ HVM Lithography roadmaps for the next 10 years for your company ?

- ✓ All kind of memory will be shrinking
- ✓ Semiconductor business will mature, if lithograph & mask cost reduction is not performed extremely.

## ■ EUVL HVM Timelines ?

- ✓ Light source performance is improving, but a significant concern.

## ■ 300mm or 450mm ?

- ✓ Investment improvement is 7%, ratio of gross up is 230%

## ■ Higher NA of EUVL ?

- ✓ 9inch Mask is prefer to shrink exposure field in memory device
- ✓ EUVL+DSA DSA may become one big choice in the future.

# **TOSHIBA**

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